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IMMEDIATE WATER POLLUTION CONTROL NEEDS SOUTH PLATTE RIVER BASIN

FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
DENVER, COLORADO

MARCH 1967

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SOUTH PLATTE RIVER BASIN

UNITED STATES
DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION
SOUTH PLATTE RIVER BASIN PROJECT
DENVER, COLORADO

MARCH 1967

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Immediate pollution control needs covering the interstate as well as the major intrastate streams in the South Platte River Basin in Colorado are described. The prime purpose of this report is to focus attention on known sources of pollution which affect legitimate and beneficial water uses, including the aesthetic environment of the streams. The findings, conclusions, and recommendations are based on detailed engineering studies. The immediate needs identified have to do with municipal waste sources, industrial waste sources, outfalls as sources of pollution, and cattle feedlots. Institutional practices are discussed, along with the cost of immediate pollution control and abatement, and recent progress. A bibliography is included.

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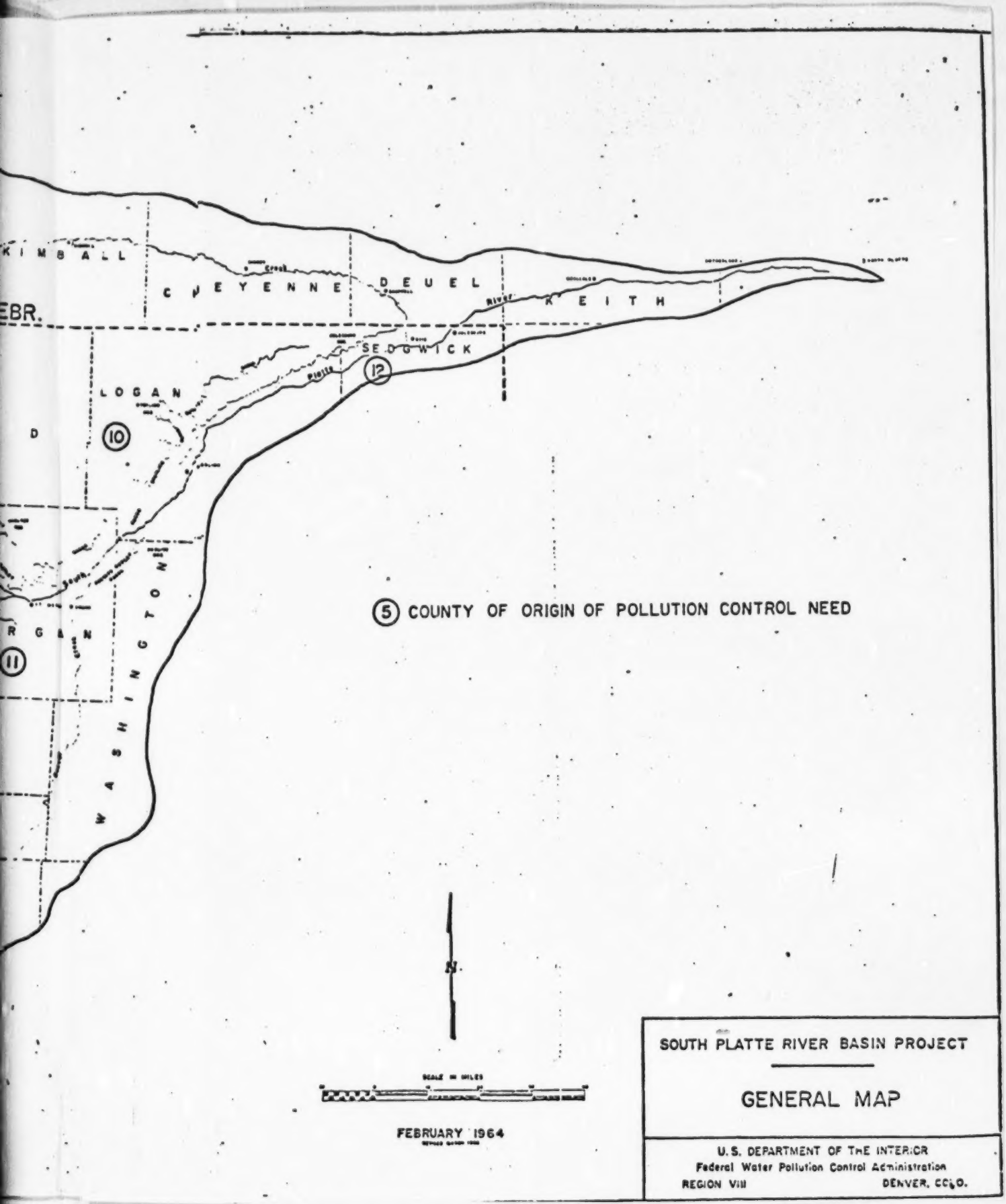

FEBRUARY 1964

SOUTH PLATTE RIVER BASIN PROJECT

GENERAL MAP

U.S. DEPARTMENT OF THE INTERIOR
Federal Water Pollution Control Administration
REGION VIII DENVER, COLO.

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I. INTRODUCTION

This report describes Immediate Pollution Control Needs covering the interstate as well as the major intrastate streams in the South Platte River Basin within the State of Colorado. Its prime purpose is to focus attention on known sources of pollution which affect legitimate and beneficial water uses, including the aesthetic environment of the streams. The findings, conclusions, and recommendations contained in this report are based on detailed engineering studies conducted by the Federal Water Pollution Control Administration's South Platte River Basin Enforcement Project initiated at the request of the Governor of Colorado in October of 1963, under the provisions of the Federal Water Pollution Control Act, as amended (33USC466 et seq). Although at this time Project studies and detailed engineering reports are not complete, much information is available and summarized in the following material.

II. SUMMARY OF IMMEDIATE POLLUTION CONTROL NEEDS

Priority indicated by letter in parenthesis, map location indicated by number.

(A) Prior to Jan. 1, 1968
(B) " " " " 1969
(C) " " " " 1970
(D) Prior to June 30, 1971

A. Municipal Waste Sources

Area	Responsibility	Need	Priority
1	Adams Co.		
	Aurora (Westerly Treat. Plant)	Divert total effluent to Denver Metro system.	(A)
	Baker WSD 1/	Divert total effluent to Denver Metro system.	(A)
	North Washington SD	Divert all wastes to Denver Metro system.	(A)
	Thornton	Divert all wastes to Denver Metro system.	(A)
2	Arapahoe Co.		
	Englewood	Improved chlorination facilities under construction; scheduled completion April 1967.	(A)
	Littleton	Chlorination facilities.	(A)
3	Boulder Co.		
	Boulder	New secondary treatment facilities presently under construction; scheduled completion August 1968.	(B)
	Broomfield Hts.	Recirculation and chlorination facilities presently under construction; scheduled completion May 1967.	(A)
		Engineering study in progress for expansion of secondary treatment facilities.	(A)
	Gunbarrel Estates WSD	Polishing pond facilities.	(B)

Area	Responsibility	Need	Priority
3	Boulder Co. (cont'd)		
	Longmont	Engineering study in progress.	(A)
		Expansion of secondary treatment facilities.	(B)
	Louisville	Engineering study in progress.	(A)
		Expansion of secondary treatment facilities.	(B)
	Lyons	Secondary treatment facilities	(B)
	Niwot SD	Sewer collection system & secondary treatment facilities.	(B)
	Price's Mesa Manor	Additional aeration; polishing pond & adequate chlorination.	(B)
4	Clear Creek Co.		
	Berthoud Lodge	Secondary treatment facilities; plans submitted for approval.	(A)
	Georgetown	Secondary treatment facilities; preliminary engineering report submitted to State WPC Commission.	(B)
	Idaho Springs	Recirculation; final clarifier; chlorination facilities.	(B)
6	Douglas Co.		
	Louviers	Modify existing plant.	(B)
7	Gilpin Co.		
	Blackhawk	Collection system & secondary treatment facilities; engineering study submitted to State WPC Commission.	(B)
	Central City	Collection system & secondary treatment facilities; engineering study submitted to State WPC Commission.	(B)

Area	Responsibility	Need	Priority
8	Jefferson Co.		
	Arvada [1/]	Divert total effluent to Denver Metro system.	(A)
	Camp George West	Chlorination facilities.	(A)
	Clear Creek Valley WSD [1/]	Divert total effluent to Denver Metro system.	(A)
	Evergreen	Improve sludge handling facilities & recirculation; engineering study in process.	(A)
	Fruitdale SD [1/]	Divert total effluent to Denver Metro system.	(A)
	Golden - Coors Co.	Presently expanding secondary treatment facilities; scheduled completion late Summer 1967.	(A)
	Runyan Subdivision	Connect to Denver sewer system.	(A)
	Sheridan Mobile Park	Connect to Arvada sewer system.	(A)
	South Lakewood SD	Expand secondary treatment facilities.	(B)
	Webb Trailer Crt.	Secondary treatment facilities.	(B)
	Wheatridge [1/]	Divert total effluent to Denver Metro system.	(A)
9	Larimer Co.		
	Berthoud	Eliminate excessive infiltration presently causing bypass of sewage; engineering study presently underway.	(A)
	Ft. Collins	New secondary treatment plant under construction; scheduled for completion January 1968.	(A)
		Provide chlorination facilities at existing plant.	(A)
	Johnson's Cafe & Motel	Secondary treatment facilities.	(A)
	North College SD	Connect to Fort Collins sewer system.	(A)
	Wellington	Replace existing primary facility & construct secondary treatment facilities.	(B)
	YMCA Conference Camp	Additional secondary treatment facilities under engineer design; completed construction expected mid-summer 1967.	(A)

Area	Responsibility	Need	Priority
10	Logan Co.		
	Crook	Secondary treatment facilities.	(B)
	Sterling	New secondary treatment plant overloaded by virtue of excessive industrial waste loads from Sterling Beef Company. See p. 8 of this report.	(A)
11	Morgan Co.		
	Brush	Provide chlorination facilities; new secondary treatment plant placed in operation Nov. 1966; plant overloaded due to excessive industrial waste loads from the new Sigman Packing Co. plant. See p.8 of this report.	(A)
	Ft. Morgan	Chlorination facilities.	(A)
12	Sedgwick Co.		
	Julesburg	Additional secondary treatment; heated digester; chlorination facilities.	(B)
	Ovid	Secondary treatment facilities.	(B)
13	Weld Co.		
	Ault	Additional secondary treatment facilities.	(B)
	Eaton	Secondary treatment facilities.	(B)
	Erie	Additional lagoon capacity	(B)
	Weld Co. Tri-Area SD (Fredrick; Dacona; Firestone; Evanston)	Additional lagoon capacity.	(B)
	Hudson	Combine the two one-acre ponds for better operation and treatment.	(B)

Area	Responsibility	Need	Priority
13	Weld Co. (cont'd)		
	Johnstown	Additional polishing pond to reduce coliform concentrations or adequate chlorination.	(B)
	Keenesburg	Modification of existing plant.	(A)
	La Salle	Lagoons under construction; completion scheduled May 1967.	(A)
	Milliken	Secondary treatment facilities; engineering study submitted to State Water Pollution Control Commission	(B)
	Windsor	Expand secondary treatment; provide chlorination facilities	(B)

In many cases, municipal treatment plants do not chlorinate or adequately chlorinate their effluents even though chlorination detention and feeding facilities are provided. Each and every municipal waste treatment effluent should be adequately disinfected prior to discharging to Basin waters. (A)

1/ In order that the water quality objectives for Clear Creek be met, as recommended in the Second Session of the Conference, these communities must discharge all wastes to the Denver Metropolitan Sewage Disposal District No. 1 treatment facilities. The existing treatment plants cannot, on a continuing basis, maintain the degree of treatment efficiency necessary to meet the recommended water quality objectives.

B. Industrial Waste Sources

Major Sources - Denver Metropolitan Area

Area	Responsibility	Need	Priority
5	Armour & Co., Den.	Divert drainage from: feed pens, cattle chute, area runoff, and manure-hauling trucks to sanitary sewer. Prove additional in-plant treatment for removal of paunch manure & grease.	(A)
1	Capitol Rendering Co. Adams Co.	Provide in-plant treatment of process wastes and discharge to sanitary sewer.	(A)
5	Chicago, Burlington & Quincy R.R., Den.	Provide additional pre-treatment of process wastes & divert wastes to sanitary sewer.	(A)
5	Colorado & Southern R.R., Den.	Provide additional treatment for oil separation and divert wastes to sanitary sewer.	(A)
5	Continental Oil Co., Commerce City	Provide additional treatment to further reduce concentrations of phenol and removal of chromium.	(B)
8	Adolph Coors Co., City of Golden	Expand existing secondary treatment & disinfection facilities. See p.4 of this report.	(A)
8	Coors Porcelain Co., Golden	Remove inorganic clays and divert organic wastes to sanitary sewer.	(A)
5	Denver & Rio Grande Western R.R., Den.	Provide additional in-plant treatment of process wastes, including oil removal, and divert to sanitary sewer.	(A)
5	Denver Union Stockyard Co., Den.	Divert drainage for livestock pen areas to sanitary sewer system.	(A)
5	Empire Petroleum Co. (Conoco Asphalt Co.) Commerce City	Provide additional treatment to further reduce concentrations of phenol discharged to stream.	(B)
5	Gates Rubber Co., Den.	Provide additional in-plant treatment of process wastes and divert to sanitary sewer.	(A)
1	Kuner Empson Co., Brighton	Provide adequate in-plant treatment of process wastes and divert to sanitary sewer.	(A)
1	Litvak Meat Co., Adams Co.	Divert liquid wastes from rendering plant to sanitary sewer; provide additional pre-treatment of paunch manure & grease.	(A)

Area	Responsibility	Need	Priority
5	Public Service Co. of Colo., Zuni Plant, Den.	Provide additional settling ponds for fly ash and water-softening backwash waters.	(A)
5	Samsonite Corp., Den.	Provide additional in-plant treatment of process waste and divert to sanitary sewer.	(A)
5	Stapleton International Airport, Den.	Provide adequate pre-treatment of wastes and divert to sanitary sewer.	(A)
5	Tenneco Oil Co., Commerce City	Provide additional treatment to further reduce concentrations of phenol discharged to stream.	(B)
5	United Fryer & Stillman, Inc., Den.	Provide adequate in-plant treatment for removal of paunch manure & grease; divert process and rendering wastes, after pre-treatment, to sanitary sewer	(A)
5	Wilson & Co., Inc. Den.	Provide additional in-plant treatment for removal of paunch manure & grease.	(A)
	Major Sources - Remainder of Basin		
3	Kuner Empson Co., Longmont	Provide necessary in-plant treatment & divert to sanitary sewer; or provide equivalent to secondary treatment with adequate disinfection before discharging to stream.	(B)
13	Lowell-Paul Dairy, Greeley	Provide additional treatment & adequate disinfection facilities or complete retention of wastes, with no overflow to stream.	(B)
13	Monfort Packing Co., Greeley	Divert remaining direct discharges from stream to sanitary sewer after adequate pre-treatment.	(A)
13	Weld County Bi-Products Co., Greeley	Provide equivalent of secondary treatment & adequate disinfection.	(B)
11	Sigman Packing Co., Brush	Provide additional in-plant treatment for all process wastes, including removal of paunch manure, blood, and grease prior to discharge to sanitary sewer.	(A)
10	Sterling Beef Co., Sterling	Exclude blood, paunch manure & grease from sanitary sewer; provide adequate in-plant pre-treatment of process wastes before discharging to sanitary sewer.	(A)

Other Sources - Denver Metropolitan Area

Area	Responsibility	Need	Priority
1	Aero Airplane Oil Co., Adams Co.	Provide adequate removal of oily wastes before discharge to stream.	(B)
1	Altberger Packing Co., Adams Co.	Provide adequate in-plant treatment of process wastes, including blood, grease, and paunch manure removal, before discharge to sanitary sewer.	(A)
2	American Coleman Co., Littleton	Divert floor drainage to sanitary sewer.	(B)
1	Continental Baking Co., Adams Co.	Divert truck washing wastes to sanitary sewer.	(A)
2&5	Robinson Brick & Tile Co., Denv. and Englewood plants	Provide in-plant treatment of process wastes and divert to sanitary sewer.	(B)
8	Sigman Meat Co., Inc. Jeff. Co.	Divert process "cooling" water to sanitary sewer.	(B)
1	Sundstrand-Denver, Division of Sundstrand Corp., Adams Co.	Provide in-plant pre-treatment of "cooling" water and divert to sanitary sewer.	(A)
5	Union Pacific R.R., Den.	Eliminate all wastes discharges from the storm sewers, pre-treat and divert to the sanitary sewer.	(A)
1	Williams Refining Co., Adams Co.	Eliminate oils from process "cooling" water before discharge to stream.	(B)

Other Sources - Remainder of Basin

9	Cherry Products Co., Inc., Loveland	Eliminate discharge to stream by retention of process wastes.	(B)
9	Dreher Pickle Co., Ft. Collins	Divert wastes associated with pickle tanks to sanitary sewer.	(B)
10	Sterling Packing Co. Sterling	Expand existing lagoon system to retail all process wastes.	(B)

Sugar Beet Industry

Area	Responsibility	Need	Priority
1	GWS, Brighton	Have installed recirculating system for 1966-1967 campaign. Additional modifications are planned by the company prior to 1967-1968 campaign.	(A)
3	GWS, Longmont	Will construct recirculation system prior to 1967-1968 campaign and awarded 3-year WPRD Grant for treating excess water by anaerobic and/or aerobic processes. See p. 25 of this report.	(A)&(C)
9	GWS, Loveland	Recirculating flume & waste water system or equal.	(D)
13	GWS, Johnstown, MSG	Present contract with British Columbia Research Council for laboratory feasibility study & engineering on partial system by late Spring 1967. See p. 26 of this report.	(D)
13	GWS, Windsor	Company reported closing this plant following 1966-1967 campaign.	--
13	GWS, Eaton	Recirculating flume & waste water system scheduled for completion prior to 1967-1968 campaign.	(A)
13	GWS, Greeley	Install recirculating flume & waste water system or equal.	(D)
11	GWS, Ft. Morgan	Install recirculating flume & waste water system or equal.	(D)
10	GWS, Sterling	Presently installing pulp dryer. Install recirculating flume & waste water system or equal.	(D)
12	GWS, Ovid	Install recirculating flume & waste water system, or equal.	(D)

C. Outfalls as Sources of Pollution

From surveys conducted by the South Platte Project there are some 639 outfalls, pipes, and ditches that represent potential or real sources of pollution to Basin streams. Of these 639 discharges the following actions are recommended:

Area			
	1. Major waste discharges --		
5	a. Denver Metropolitan Area -- Divert wastes to the sanitary sewer system.	60 Outfalls	(B)
3	b. City of Boulder -- Divert wastes to the sanitary sewer system.	4 Outfalls	(B)
3	c. City of Longmont -- Divert wastes to the sanitary sewer system.	3 Outfalls	(B)
9	d. City of Fort Collins -- Divert wastes to the sanitary sewer system.	3 Outfalls	(B)
13	e. Town of Eaton -- Provide adequate treatment.	1 Outfall	(B)
13	f. City of Greeley -- Divert wastes to the sanitary sewer system.	3 Outfalls	(B)
	2. Discharges of lesser significance; sampling program necessary by the proper regulatory agency, followed by abatement program of diverting wastes to sanitary sewer system --		
5	a. Denver Metropolitan Area -- Divert wastes to the sanitary sewer system.	467 Outfalls	(D)
3	b. City of Boulder -- Divert wastes to the sanitary sewer system, or provide adequate treatment.	54 Outfalls	(D)

Area			
9	c. City of Loveland -- Divert to the sanitary sewer system or provide adequate treatment.	13 Outfalls	(D)
9	d. City of Fort Collins -- Divert to the sanitary sewer system or provide adequate treatment.	11 Outfalls	(D)
13	e. City of Greeley -- Divert to the sanitary sewer system or provide adequate treatment.	9 Outfalls	(D)
11	f. City of Fort Morgan -- Divert to the sanitary sewer system or provide adequate treatment.	3 Outfalls	(D)
10	g. City of Sterling -- Divert to the sanitary sewer system or provide adequate treatment.	8 Outfalls	(D)

D. Cattle Feedlots as Sources of Pollution

There are some 43 cattle feedlots serving from 1,000 to nearly 50,000 head per lot in the South Platte River Basin in Colorado. In addition, there are numerous smaller feedlots serving less than 1,000 head of cattle per lot within the Basin. Of the 43 major feedlots, nine are considered to be significant contributors to stream pollution.

Area			
13	1. Monfort (Greeley)	40,000-50,000 head	(B)
1	2. National Foods Company (Brighton)	7,000-10,000	(B)
13	3. Farr Farms (Greeley)	7,000-10,000	(B)
1	4. Mancini (Brighton)	4,500- 7,500	(B)

Area				
11	5.	Weisbart (Brush)	5,000	(B)
5	6.	Western Beef Factory (Denver)	5,000	(B)
13	7.	Mt. View Angus Ranch (Platteville)	1,000-2,000	(B)
3	8.	Ludlow (Longmont)	1,000-1,500	(B)
13	9.	Tittle (Greeley)	1,000	(B)

The suggested action to abate potential pollution and nuisance problems by the feedlot industry is as follows:

1. Initiate a program for frequent removal of manure and other waste material in the feedlots.
2. Reduce odor and nuisance conditions to a minimum by proper sanitary control.
3. Construct berms or suitable drainage facilities to divert upland surface drainage from the feedlot area.
4. Construct adequate treatment facilities such as the use of lined retention ponds, or treat the wastes by equivalent means.

III. WATER QUALITY OBJECTIVES AND FLOW AUGMENTATION

The principal present and future uses of the waters of the South Platte River are: 1) municipal water supply; 2) industrial water supply; 3) agriculture; 4) recreation, including water-contact sports; 5) establishment of fish and aquatic life; 6) preservation of wildlife; and 7) aesthetic enjoyment. At this time, agricultural irrigation needs require and use the greatest amounts of water; however, turning to the future of the South Platte Valley, with the resultant expanding population, the influx of industry, and the demand by residents and visitors alike for adequate recreational facilities, the pattern of past use is already changing.

Certain water quality objectives have been previously developed by the Project to protect and preserve the waters for present and future beneficial uses. These water quality objectives are as follows:

1. In the main-stem South Platte River from just above the City of Littleton to the discharge of Metropolitan Denver Sewage Disposal District No. 1 treatment facility; in Bear Creek from the Town of Evergreen to its mouth; and in Cherry Creek from Cherry Creek Reservoir to its mouth --
   a. The dissolved oxygen (DO) content be maintained at not less than 5 mg/l;
   b. The 5-day, 20°C Biochemical Oxygen Demand (BOD) level not be allowed to exceed 10 mg/l; and
   c. The total and fecal coliform levels not be allowed to exceed 2,400 and 500 bacteria per 100 ml, respectively.
2. In the main-stem South Platte River from just below the discharge of Metro-District treatment facilities to just above the discharge from the Great Western Sugar Company in the City of Brighton; all of Sand Creek, in Clear Creek from the City of Golden to its mouth --
   a. The dissolved oxygen (DO) content be maintained at not less than 4 mg/l;
   b. The 5-day, 20°C BOD level not be allowed to exceed 20 mg/l; and
   c. The total and fecal coliform levels not be allowed to exceed 5,000 and 1,000 bacteria per 100 ml, respectively.

3. In the main-stem South Platte River from just below the discharge from the Great Western Sugar Company mill in the City of Brighton to the Colorado-Nebraska State Line; in the St. Vrain Creek from Longmont to its mouth; in the Big Thompson River from Loveland to its mouth; in the Little Thompson River from Johnstown to the stream mouth; and in the Cache la Poudre River from Windsor to the stream mouth --

   a. The dissolved oxygen (DO) content be maintained at not less than 4 mg/l;

   b. The 5-day, 20°C BOD level not be allowed to exceed 15 mg/l; and

   c. The total and fecal coliform levels not be allowed to exceed 5,000 and 1,000 bacteria per 100 ml, respectively.

Adequate treatment of wastes alone cannot at all times provide the water quality that is necessary. The withdrawals from the streams for irrigation, particularly during periods of critical low flow, in many instances, does not leave sufficient water to provide the necessary dilution of waste discharges. Therefore, flow augmentation in addition to an effective waste abatement program is necessary and vital in the future to achieve satisfactory water quality in the Basin streams. It is estimated that flow augmentation in the order of 10,000 to 18,000 acre-feet per year is needed on the main-stem of the South Platte River and 6,000 to 11,000 acre-feet per year each on St.Vrain Creek, the Big Thompson, and the Cache la Poudre Rivers. In the Second Session of the Conference the Project recommended that: minimum streamflows of 25 cfs be maintained on the main-stem South Platte River throughout the entire

year and at all locations, from upstream of Littleton down to the Colorado-Nebraska State Line; and minimum streamflows of 15 cfs be maintained on St. Vrain Creek from above Longmont downstream, on the Big Thompson River from above Loveland downstream, and on the Cache la Poudre River from above Windsor downstream, throughout the entire year and at all locations within the designated areas.

It is realized that present State water laws do not recognize the use of water for dilution or flow augmentation as a beneficial water use. For the present, it seems probable that Colorado courts would not allow an appropriation of unappropriated water added to a stream where the appropriation is for the purpose of controlling the quality of the water in the stream.

In view of the foregoing, at the reconvening of the Second Session of the Conference the recommendations concerning flow augmentation were revised and reported as follows:

It is recommended that the State Water Pollution Control Commission develop, in the near future, a Water Resource Management Plan. This Water Resource Management Plan should include control over, and regulation of, the water system, as well as the wastes discharged into it, and may best be developed in close cooperation and coordination with the various Federal and State agencies that are concerned with water quantity and quality management practices.

IV. INSTITUTIONAL PRACTICES

The State of Colorado should proceed to adopt standards, as required by the Federal Water Pollution Control Act, for the interstate streams in the South Platte River Basin. In addition, standards for intrastate streams in the Basin should be adopted along similar lines. These standards should: (1)

A. Clearly recognize all legitimate and beneficial uses of water, including municipal water supply; industrial water supply; agriculture; recreation, including water-contact sports; establishment of fish and aquatic life; preservation of wildlife; and aesthetic enjoyment; and

B. Clearly recognize and adhere as closely as possible to the conclusions and recommendations set forth in the Second Session and Reconvened Second Session of the Conference in the matter of Pollution of the South Platte River Basin in the State of Colorado held April 27-28, 1966 and November 10, 1966.

The State of Colorado should develop a Water Resource Management Plan for the South Platte River Basin which includes control over, and regulation of, the water system, as well as the wastes discharged into it. (2)

The State of Colorado should exercise control to insure that flows released from storage for water quality control are not appropriated for other uses. (4)

The State of Colorado should consider legislation to provide appropriations for State participation in grants for construction of sewage treatment works. (1)

The staffs of the appropriate State agencies should be increased to provide the necessary supervision and technical advice for carrying out an effective water supply and pollution control program. (1)

The State of Colorado should undertake a program of surveillance of the South Platte River Basin waters to obtain the data required for constant evaluation and insure the highest possible benefits consistent with future legitimate and beneficial water uses. (1)

The State of Colorado should develop a mandatory certification program for waste treatment plant operators. (2)

V. COST OF IMMEDIATE POLLUTION CONTROL AND ABATEMENT

Estimates of the cost of waste abatement measures enumerated in this report are broken down into the following categories:

Source	Millions of Dollars
Municipal Wastes	12.2
Industrial Wastes (excluding the Sugar Beet industry and outfall discharges in the Denver Metropolitan Area and remainder of Basin)	2.6
Sugar Beet Industry	3.0
Feedlots (9 major lots)	0.5
Outfall Discharges-Denver Metropolitan Area and remainder of Basin	1.2
Total	19.5

VI. RECENT PROGRESS IN POLLUTION CONTROL

The First Session of the Conference in the matter of Pollution of the South Platte River Basin within the State of Colorado was held on October 29, 1963. At this Conference it was established that a study would be undertaken by the facilities of the U. S. Public Health Service, now the Federal Water Pollution Control Administration, and that the findings and recommendations from this study would lead to a program of pollution abatement to be developed jointly by the South Platte River Basin Project and the Colorado State Department of Public Health.

In the Second Session of the Conference, held on April 27-28, 1966, a progress report was made by the Project and included specific recommendations and remedial time schedules for the Denver Metropolitan Area, and in addition for the sugar beet and cattle feedlot industries in the Basin. Specific water quality objectives were recommended for the South Platte River and for the lower reaches of major tributary streams. Flow augmentation in these streams was also recommended in order to satisfy the water quality objectives. The Conferees agreed that a reconvening of the Second Session of the Conference would take place in approximately three months following the close of the Second Session. This was done in order that the newly-formed State Water Pollution Control Commission could have an opportunity to study the Project's report and come up with adjustment, or agreement, on implementation of the recommended programs.

In March 1966, a Water Pollution Control Act was signed into law creating an eleven member State Water Pollution Control Commission as a Division of the State Department of Public Health. By law this

Commission has been given broad powers to regulate, control, and abate pollution in the waters of the State of Colorado.

Effective July 1, 1966, the City and County of Denver adopted an ordinance covering the control of sewage and industrial discharges into storm and sanitary sewers and water courses within the City and County of Denver limits.

As a result of the reconvening of the Second Session of the Conference held on November 10, 1966, certain conclusions and recommendations were unanimously agreed upon by the conferees, the more pertinent of which are listed below:

1. All discharges into the South Platte River Basin shall have adequate remedial or control facilities in full operation by June 30, 1971, so as to comply with water quality standards established by the Colorado Water Pollution Control Commission as approved by the Secretary of the Interior.

2. Time schedules announced at the Conference (Reconvened Second Session) for specific municipalities and industries which will fall within the above time schedule are approved.

3. The State Water Pollution Control Commission and the Federal Water Pollution Control Administration will have progress evaluation meetings at six-month intervals to determine compliance with the above requirements. At the first progress meeting, representatives of the Colorado Water Pollution Control Commission will supply specific time

schedules for those sources of pollution for which time schedules were not supplied at this Session of the Conference.

The following is a list of actions that have been taken, or are scheduled to be taken, to abate pollution and improve water quality in the Basin streams:

A. Municipalities

The Denver Metro Sewage Disposal District No. 1, a thirty million dollar investment in collection and treatment facilities, went into operation in October 1966. The following communities and/or sanitation districts discharge all their wastes to the Denver Metro plant for secondary treatment:

1. Denver-Northside Treatment Plant
2. Denver-Eastside Treatment Plant
3. Northwest Lakewood Sanitation District
4. City of Westminster
5. Federal Correctional Institute (Federal Youth Center)
6. Applewood Sanitation District
7. Pleasant View Sanitation District
8. Westridge Sanitation District
9. North Table Mountain Sanitation District

The following communities provide secondary treatment to a portion of their wastes, the remainder being discharged to the Denver Metro treatment plant:

1. City of Arvada treats 0.8 MGD; remainder to Denver Metro and upon completion of chlorination facilities all effluent will be disposed of to Clear Creek.

2. Baker Sanitation District treats 0.8 MGD; remainder to Denver Metro.

3. City of Wheatridge - physically connected to Denver Metro system; however, presently operating existing treatment plant and discharging inadequately treated effluent to stream.

The following communities are completing negotiations and necessary construction to connect to the Denver Metro system before January 1, 1968:

1. North Washington Sanitation District
2. City of Thornton
3. City of Aurora (Westerly Treatment Plant)

The following communities have recently completed, or are in the process of completing, necessary expansion of existing treatment facilities, and/or constructing new facilities:

1. Clear Creek Valley Sanitation District
2. City of Littleton
3. Buckley Air Station
4. City of Englewood
5. City of Golden (Adolph Coors Company)
6. City of La Salle
7. City of Boulder
8. Town of Brush
9. City of Fort Collins
10. Kittredge Sanitation District
11. Broomfield Heights
12. City of Sterling

The following communities have submitted preliminary engineering reports to the State Water Pollution Control Commission and have applied for Federal Grant monies:

1. Blackhawk
2. Central City
3. Georgetown
4. Milliken
5. Eaton
6. Ovid

B. Industries

The following industries are reported to have recently made the necessary connections to discharge all of their wastes to the Denver Metro treatment plant, except as noted:

1. Armour and Company (cooling water discharged to South Platte River).
2. United Fryer and Stillman, Inc. (cooling water discharged to South Platte River).
3. Packaging Corporation of America
4. Samsonite Corporation

The following industries are reported to have recently made the necessary connection to discharge all of their wastes to the North Washington Sanitation District. The North Washington Sanitation District treatment plant is scheduled to discharge its entire effluent to the Metro District treatment plant on or before January 1, 1968:

1. Capitol Rendering Company
2. Litvak Meat Company

The Coors Porcelain Company is scheduled to complete necessary treatment facilities by January 1, 1968.

The Kuner Empson Company (Brighton) has an engineering study underway for eventual connection to the City of Brighton treatment plant.

The Public Service Company of Colorado (Zuni Plant) has scheduled completion of settling ponds for September 1967.

An engineering study for the Stapleton International Airport was completed in February 1967. Appropriate abatement action should be completed by January 1968.

The Gates Rubber Company is scheduled to remove their industrial waste discharges from the City storm sewers and provide in-plant pre-treatment and subsequent discharge to the Denver Metro treatment system by June 1967.

Gates Cyclo Poultry Farm is reported to be hauling and spreading their wastes on farm land and no longer discharging to the waters of the Basin.

Great Western Sugar Company's Brighton mill has installed a partial recirculating flume and waste water system for the 1966-67 campaign. This type system should, if designed and operated properly, prove to be an adequate system for controlling wastes discharged to streams.

Great Western Sugar Company has scheduled a similar recirculating system to be installed at the Eaton, Colorado mill prior to the 1967-68 sugar beet campaign.

The Beet Sugar Development Foundation is receiving Federal Grant monies under Section 5 of the Federal Water Pollution Control Act, as amended, for studies being conducted at the Tracy, California sugar beet mill. These studies were initiated in June 1965 and are projected to continue through May 1970. The overall objective of this project is to demonstrate the possibility of reducing and eliminating pollution and odor problems in beet sugar factory wastes through the application of the anaerobic-facultative-aerobic lagooning system.

The Windsor, Colorado plant has ceased operations following the 1966-67 campaign. The mill at Sterling, Colorado will have a pulp dryer installed prior to the 1967-68 campaign. With the closing of the Windsor mill and the installation of a pulp dryer at Sterling, all mills in the Basin within the State of Colorado will be operating with pulp dryers for the 1967-68 campaign.

Great Western Sugar Company, through the Beet Sugar Development Foundation, was awarded a three-year Water Pollution Research & Development Grant in December 1966. The total estimated cost of this project is $372,500, of which $102,000 is Federal monies. This grant is for the Longmont, Colorado mill. The objective of the project is to concentrate sugar beet factory wastes by chemical precipitation and reuse of the decanted solution in a closed recirculation system. The excess water accumulated during the operation will be treated by anaerobic and/or aerobic processes to remove BOD prior to discharge. This method of anaerobic-aerobic treatment is tied into the above-mentioned study being carried on at the Tracy, California plant, and the waste treatment system recently installed at the Brighton, Colorado sugar mill.

The British Columbia Research Council is under contract from Great Western Sugar Company to perform laboratory feasibility studies on their Johnstown, Colorado Monosodium Glutamate mill and is scheduled to begin engineering studies on a pilot plant, or a partial full-scale system, by late Spring 1967.

The Federal Water Pollution Control Administration has recommended authorization of storage for quality control in the Corps of Engineers' proposed Chatfield Dam and Reservoir Project and the Bureau of Reclamation's Narrows Project. Both of these projects are on the main-stem, South Platte River. State and Federal fishery agencies have recommended storage and subsequent releases for maintenance of a cold water fishery below both projects which would fulfill the other quality needs.

Similarly, the Federal Water Pollution Control Administration may recommend storage for water quality control in other proposed Federal reservoirs as these projects are developed and needs are determined.

VII. BACKGROUND

A. Pertinent Basin Characteristics

The South Platte River drainage encompasses 24,300 square miles, of which 19,450 is contained within the State of Colorado, and 2,050 and 2,800 square miles, respectively, in the States of Wyoming and Nebraska. The South Platte River originates on the east side of the Continental Divide in Central Colorado, flows northeast across the State of Colorado, and joins the North Platte River at North Platte, Nebraska. Principal tributaries of the South Platte River within the

State of Colorado are Bear Creek, Cherry Creek, Sand Creek, Clear Creek, St. Vrain Creek, the Big Thompson River, and the Cache la Poudre River.

The primary source of native surface runoff in the Basin originates from melting snowpack in the mountainous area. The water resources of the South Platte Basin consist of surface and ground water and transmountain diversion waters. Approximately 1.25 million acre-feet of native surface water is available each year. Transmountain diversions are in the order of 0.35 million acre-feet of water per year. Ultimate diversions are expected to approximate 0.6 million acre-feet on an annual basis. Ground water supply in the Basin is used extensively for land irrigation. Surface water resources in the South Platte Basin have been greatly over-appropriated for irrigation use. Lowest surface water flows are expected in the Basin during the winter period. In the summer, critical flow conditions also occur at many points on Basin streams where agricultural diversions may use all, or nearly all, of the available streamflow.

The 1960 population of the Basin was slightly in excess of one million persons, of which 92 percent were within the State of Colorado, and 4 percent each within Wyoming and Nebraska. The population has increased at a very rapid rate. From 1940 to 1950 it increased from 660,000 to 840,000 with an estimate for 1963 of 1,160,000 persons.

The population of the Denver Metropolitan area has been particularly remarkable with an increase from 1950 to 1960 of 499,000 to 804,000 and a further rise to over 1,000,000 persons as of mid-1965. The Denver Metropolitan area contains about 70 percent of the total Basin population and is an extremely important manufacturing and trade center for a large

part of the Rocky Mountain Region. Other centers of population in the Basin, as of 1960, include Boulder (37,718 population); Fort Collins (26,596 population), and Greeley, Colorado (26,314 population).

The 17-county area of the State of Colorado within the South Platte River Basin has experienced great industrial and commercial expansion since 1940. The area outside the four-county Denver Metropolitan area has agriculture as its principal activity. In 1959, 984,000 acres within the Basin were irrigated, of which 913,000 acres were in the State of Colorado, and 27,000 and 44,000 acres, respectively, in the States of Wyoming and Nebraska.

Principal irrigated crops are alfalfa, corn, sugar beets, barley, dry beans, oats, winter wheat, spring wheat, potatoes, and miscellaneous. The miscellaneous group includes lettuce, cabbage, radishes, peppers, and onions.

The livestock production activity in the middle and lower portions of the South Platte River Basin is one of the largest in the United States. This activity varies from irrigated mountain meadow pasture and dry rangeland to intensified dry-lot feeding.

An estimated 3.7 million acre-feet of water per year, including reuse, are withdrawn at the present time from surface and ground sources for domestic use, industrial supplies, and for irrigation. These same waters are also used for fishing, swimming, and other recreational purposes; for livestock watering, and for production of hydroelectric power.

Provision for adequate municipal water supply to serve needs of the Basin has been a major problem. Data collected over the period

1960-1963 show that surface water is used exclusively to supply 174 million gallons per day, or 194,000 acre-feet of water annually, to a population of 795,000. Approximately 80 percent of these domestic water consumers are supplied through the Denver system. Ground water sources provide approximately 18 million gallons per day, or 20,000 acre-feet of water annually, to serve a total municipal population of 90,000. A combination of surface and ground water supplies provide 32 million gallons per day, or 36,000 acre-feet annually, for the needs of a population of 155,000.

In summary, surface and ground water sources are relied upon to deliver 224 million gallons per day, or 250,000 acre-feet of water annually, to satisfy a total municipal population of over 1,160,000. The average per capita consumption of both surface and ground water is about 215 gallons per capita per day.

The industries of the South Platte Basin rely largely upon municipal supplies to provide water of suitable quantity and quality. However, about 25 of the major industrial users, including the sugar beet factories, have individual supplies derived from ground water or irrigation canals, or a combination of both. The water requirements of industry not connected to municipal systems are estimated as more than 50,000 acre-feet annually.

Agricultural irrigation is by far the largest user of water in the Basin. Limited data indicated that 2.1 million acre-feet of surface water is used for irrigation. (This includes reuse.)

Irrigation also uses large quantities of ground water. In 1964, 6,500 pumps furnished about one million acre-feet of ground water to approximately 550,000 acres in the South Platte River Basin in Colorado.

The Bureau of Reclamation estimates the average annual depletion in the South Platte Basin over the period 1930-1949 was 1.14 million acre-feet.

Water resources of the South Platte River Basin have great recreational value. In 1966 tourist trade gross business was valued at 575 million dollars for the State of Colorado. A significant portion of this trade is credited to the Basin area within Colorado. In their natural state, headwater streams support an excellent fishery; however, pollution has resulted in depletion of the fishery resources of the Basin. The Colorado Fish and Game Department over the years has maintained fish hatcheries and an active restocking program to increase game fish populations. During 1962 about 1.5 million rainbow and brown trout of legal size to catch were planted in waters of the South Platte River Basin. A number of large water storage reservoirs provide opportunities for fishing, swimming, boating, water skiing, and other water-based activities. The mountain region, including Rocky Mountain National Park, attracts millions of tourists each year.

Use of Basin waters for livestock watering is important. Production of hydroelectric power on the headwaters of tributary streams is vital to the economy of the area. Waterways of the Basin also support the needs of large numbers of wildlife, including large and small game and migratory fowl.

B. Present Water Quality Problems

Based on the studies conducted by the South Platte River Basin Project in 1965 through Spring of 1966, the following water quality problems were found to exist:

Both the sewage and industrial waste discharges to the South Platte River and its tributaries in the Denver Metropolitan area contain a variety of obnoxious constituents which damage water quality and restrict its use for most legitimate and beneficial uses. These effects persist a considerable distance below Denver.

Project findings show for this area:

1. Coliform densities greatly exceed all commonly accepted standards for recreational use in almost all reaches of the South Platte River and its tributaries and presents a health hazard to those persons coming in contact with the waters;
2. Oxygen demanding wastes have caused low dissolved oxygen levels in many reaches of the South Platte River below Denver, causing near septic conditions in the stream to the detriment of fish and other aquatic life;
3. Suspended and settleable solids form sludge deposits in the River which have destroyed desirable aquatic plants and animals and create sight and odor nuisance conditions which preclude use or development of riverside recreational areas; and
4. Pollution of the South Platte River has affected groundwater supplies and has thus created a hazard to health.

The second major study area is termed "Middle and Lower Basin." This area encompasses the South Platte River from the City of Brighton to the Colorado-Nebraska State Line and its tributaries, the St. Vrain Creek, the Big Thompson River, and the Cache la Poudre River.

Pollution in this area from municipal and industrial wastes has caused significant problems. Feedlot operations contribute high bacterial concentrations to the waters in the South Platte River Basin and have created sight and odor nuisances along the banks of the stream.

Organic pollution of the South Platte River and its tributaries has created conditions ideal for the breeding of mosquitoes, rats, and flies which can transmit diseases to humans such as the plague, encephalitis, and a wide range of enteric diseases.

Wastes from the beet sugar processing industry contribute heavily to the gross pollution of the Middle and Lower South Platte River Basin. This pollution interferes with most legitimate and beneficial uses of the River and its tributaries.

C. Operation of Municipal Waste Treatment Plants

Project studies of municipal waste treatment plants in the South Platte River Basin show that the lack of proper operation and control of the physical plant is of grave concern and should be given high priority by the State of Colorado.

Three components of sound operation for any waste treatment plant are: 1) personnel, 2) laboratory control, and 3) records. Sufficient personnel with skills commensurate to the size and complexity of the plant are required to obtain the degree of treatment provided by the plant design and to maintain and protect the community's investment in the physical plant. In order to measure the degree of treatment being obtained and to locate existing or impending operational troubles, adequate laboratory control must be

exercised. The third operating component, keeping records, is necessary for proof of performance and for use in planning and justifying future plant needs and expansions.

"Recommendations for Minimum Personnel, Laboratory Control, and Records for Municipal Waste Treatment Works," adopted in 1963 by the Conference of State Sanitary Engineers and published in cooperation with the Department of Health, Education, and Welfare, outlines by plant capacity, the minimum requirements for each component in order to provide adequate operation control (10).

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